IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of
Masaru HIDAKA et al.
Serial No.: 10/533,432 Art Unit: 1621
Filed: April 21, 2006 Examiner: Kellette Gale
For: DEPOLYMERIZATION PROCESS

DECLARATION OF UNDER 37 C.F.R. 1.132

Honorable Commissioner of
Patents and Trademarks
Alexandria, VA 22313-1450

I, Takaharu NAKAGAWA, residing at 2-16-19 Kikumidai, Heguri-cho, Ikoma-gun, Nara, Japan, declare and say as follows:

1. I am one of the joint inventors of the above identified application;

2. I graduated from the Department of Chemical Engineering, Faculty of Engineering, Kobe University, Hyogo, Japan in March 1981 and received a Master Degree in Chemical Engineering from the Graduate School of Kobe University in March 1983;

3. Since April 1983 to the present, I have been employed by Panasonic Electric Works Co., Ltd., the former Matsushita Electric Works, Ltd. Since 1983 to 2001, I was engaged in the research works on the development of energy equipment-related technology, garbage processor-related technology, deodorization treatment-related technology, and so on. Since 2001 to the present, I have been engaged in the research works on the development of FRP recycling technology.

4. I read the Office Action issued on April 3, 2009 in the above identified application and the prior arts cited therein.

Then, I carried out experiments for showing that the effects of the present invention are obtained only by decomposing a crosslinked polyester having no chlorine with sub- or supercritical water in the presence of a base selected from $CaCO_3$, $BaCO_3$ and $Ca(OH)_2$ in an amount of 50 to 200 parts by weight relative to 100 parts by weight of the crosslinked polyester, and such effects are not obtained by decomposing polymers other than a crosslinked polyester having no chlorine.

I beg to report the results of the experiments below.

Experiment

(Experimental Example 1)

(Experimental Example 1-1)

The same procedure as in Comparative Example 1 of the present specification was repeated except for using an ABS resin (Toray Industries, Inc., "Toyolac 100") as a cured resin instead of an unsaturated polyester resin. The undecomposed resin existed in the content of the reaction tube 13 as shown in Fig. 2 of the present specification, and the decomposition rate was calculated. The results of Experimental Example 1-1 are shown in Table A.

(Experimental Example 1-2)

The same procedure as in Experimental Example 1-1 was repeated except for using calcium carbonate as a water-insoluble base. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 1-2 are shown in Table A.

(Experimental Example 1-3)

The same procedure as in Experimental Example 1-2 was repeated except for using calcium hydroxide as a water-insoluble base instead of calcium carbonate. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 1-3 are shown in Table A.

(Experimental Example 1-4)

The same procedure as in Experimental Example 1-2 was repeated except for using barium carbonate as a water-insoluble base instead of calcium carbonate. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 1-4 are shown in Table A.

(Experimental Example 2)

(Experimental Example 2-1)

The same procedure as in Comparative Example 1 of the present specification was repeated except for using a polypropylene (Japan Polypropylene Corporation, "FX4E") as a cured resin instead of an unsaturated polyester resin. The undecomposed resin existed in the content of the reaction tube 13 as shown in Fig. 2 of the present specification, and the decomposition rate was calculated. The results of Experimental Example 2-1 are shown in Table B.

(Experimental Example 2-2)

The same procedure as in Experimental Example 2-1 was repeated except for using calcium carbonate as a water-insoluble base. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 2-2 are shown in Table B.

(Experimental Example 2-3)

The same procedure as in Experimental Example 2-2 was repeated except for using calcium hydroxide as a water-insoluble base instead of calcium carbonate. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 2-3 are shown in Table B.

(Experimental Example 2-4)

The same procedure as in Experimental Example 2-2 was repeated except for using barium carbonate as a water-insoluble base instead of calcium carbonate. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 2-4 are shown in Table B.

(Experimental Example 3)

(Experimental Example 3-1)

The same procedure as in Comparative Example 1 of the present specification was repeated except for using a cured resin obtained by curing a resol resin used in a phenolic resin molding material (Panasonic Electric Works Co., Ltd., PN: CY9610) at 150°C for 20 min. as a cured resin instead of an unsaturated polyester resin. The undecomposed resin existed in the content of the reaction tube 13 as shown in Fig. 2 of the present specification, and the decomposition rate was calculated. The results of Experimental Example 3-1 are shown in Table C.

(Experimental Example 3-2)

The same procedure as in Experimental Example 3-1 was repeated except for using calcium carbonate as a water-

insoluble base. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 3-2 are shown in Table C.

(Experimental Example 3-3)

The same procedure as in Experimental Example 3-2 was repeated except for using calcium hydroxide as a water-insoluble base instead of calcium carbonate. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 3-3 are shown in Table C.

(Experimental Example 3-4)

The same procedure as in Experimental Example 3-2 was repeated except for using barium carbonate as a water-insoluble base instead of calcium carbonate. The undecomposed resin existed in the content of the reaction tube 13, and the decomposition rate was calculated. The results of Experimental Example 3-4 are shown in Table C.

[Table A]

(ABS resin)

	Exp. Ex. 1-1	Exp. Ex. 1-2	Exp. Ex. 1-3	Exp. Ex. 1-4
Decomposition temperature	360°C	360°C	360°C	360°C
Decomposition pressure	18.7 MPa	18.7 MPa	18.7 MPa	18.7 MPa
Decomposition time	20 min.	20 min.	20 min.	20 min.
Base	-	$CaCO_3$	$Ca(OH)_2$	$BaCO_3$
pH before Decomposition	7.9	9.7	13.4	9.4
pH after Decomposition	10.2	9.9	13.4	10.0
Decomposition rate	9.0%	7.5%	5.9%	6.3%

[Table B]

(Polypropylene)

	Exp. Ex. 2-1	Exp. Ex. 2-2	Exp. Ex. 2-3	Exp. Ex. 2-4
Decomposition temperature	360°C	360°C	360°C	360°C
Decomposition pressure	18.7 MPa	18.7 MPa	18.7 MPa	18.7 MPa
Decomposition time	20 min.	20 min.	20 min.	20 min.
Base	-	$CaCO_3$	$Ca(OH)_2$	$BaCO_3$
pH before Decomposition	8.6	9.7	13.4	9.4
pH after Decomposition	6.8	7.4	13.3	7.2
Decomposition rate	2.1%	2.0%	2.2%	2.9%

[Table C]

(Phenolic resin)

	Exp. Ex. 3-1	Exp. Ex. 3-2	Exp. Ex. 3-3	Exp. Ex. 3-4
Decomposition temperature	360°C	360°C	360°C	360°C
Decomposition pressure	18.7 MPa	18.7 MPa	18.7 MPa	18.7 MPa
Decomposition time	20 min.	20 min.	20 min.	20 min.
Base	-	$CaCO_3$	$Ca(OH)_2$	$BaCO_3$
pH before Decomposition	8.6	9.7	13.4	9.4
pH after Decomposition	5.9	6.5	13.0	6.5
Decomposition rate	7.8%	10.8%	16.4%	12.3%

The undersigned declares further that all statements made herein of this own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so that made are punishable by fine or imprisonment, or both, under 18 U.S. Code 1001 and that such willful false statements may be jeopardize the validity of this application or any patent issuing thereon.

Takaharu Nakagawa

Takaharu NAKAGAWA

Dated this 30 day of June, 2009